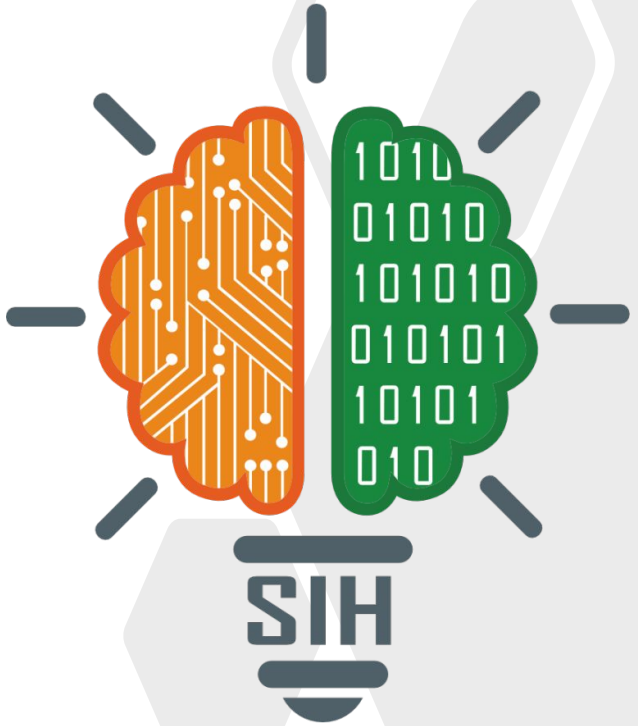
SMART INDIA HACKATHON 2025

- **Problem Statement ID – 25076**
- **Problem Statement Title-AI-Based Farmer Query Support And Advisory System**
- **Theme- Agriculture, Food Tech & Rural Development**
- **PS Category- Software**
- **Team ID-**
- **Team Name (Registered on portal)- StarWeb**



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AI Farming Assistant

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Proposed Solution:

A robust web platform designed for multilingual, multimodal farmer engagement, enabling instant expert advisory for farming challenges through AI and seamless escalation to human experts when needed.

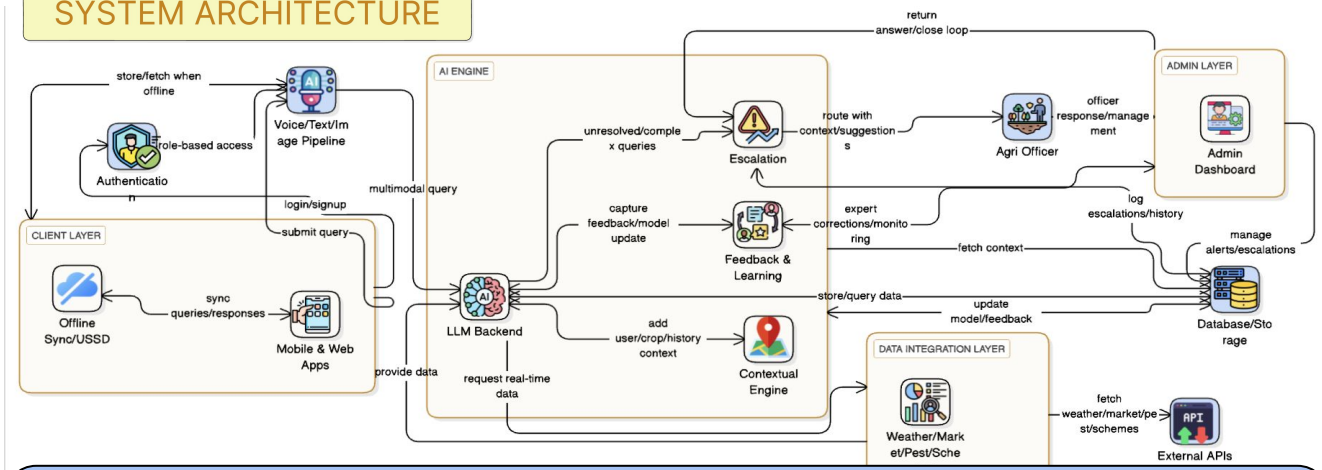
Smart Query Handling:

- **Natural Language Understanding:**
  Allows farmers to submit questions via voice, image, or text in local languages (Malayalam preferred), bridging the literacy and language divide.
- **Multimodal Input Processing:**
  Supports voice notes, typed queries, and image uploads (e.g., crop disease photographs), ensuring farmers of all backgrounds can use the system easily.

AI-Powered Knowledge Delivery:

- **Context-Aware Answers:**
  Uses large language models (LLMs) fine-tuned on agricultural data, factoring in user's location, crop, and past activity to provide hyper-local, accurate advice.
- **Dynamic Content Integration:**
  Integrates real-time weather, pest alerts, market prices, and government schemes to deliver relevant, actionable guidance.
- **Continuous Learning Loop:**
  System learns and improves from new queries, expert corrections, and farmer feedback, maintaining state-of-the-art advisory quality.

SYSTEM ARCHITECTURE



CLIENT LAYER:
1.Farmers interact through a mobile or web app using Malayalam voice, text, or images for query submission.
2.The interface is user-friendly, supporting multimodal input and instant access to advisory services, bridging literacy and language gaps.
3.Users also receive personalized answers, feedback prompts, and can escalate unresolved queries if needed.

ADMIN LAYER
1.Agri officers and support staff have dashboards to view escalated cases, respond, manage alerts, and update local expert databases.
2.Admin monitors query trends, system performance, and can provide expert feedback to refine AI responses and learning modules.
3.The admin dashboard supports feedback analysis and allows for regional customization of advisory content.

AI Engine Layer
1.LLMs process questions and images using regional crop data, pest advisories, and real-time market/weather APIs.
2.Engine personalizes advice by integrating farmer history, crop, location, and current season for tailored responses.
3.Core AI system continuously learns from feedback, expert corrections, and escalations to improve performance.

System Integration/Data Layer
1.Secure server and database modules manage user data, queries, and knowledge sources for context-aware responses and privacy
2.Integrates with external APIs for weather, market prices, pest outbreaks, and government schemes for updated recommendations.
3.Supports offline queuing, USSD fallback, and responsive sync for low-network zones to maximize accessibility.

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TECHNICAL APPROACH

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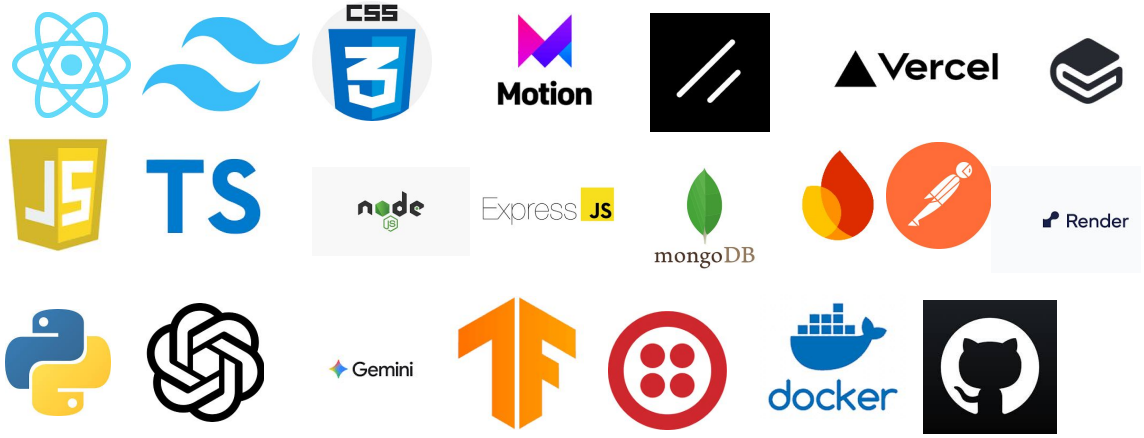
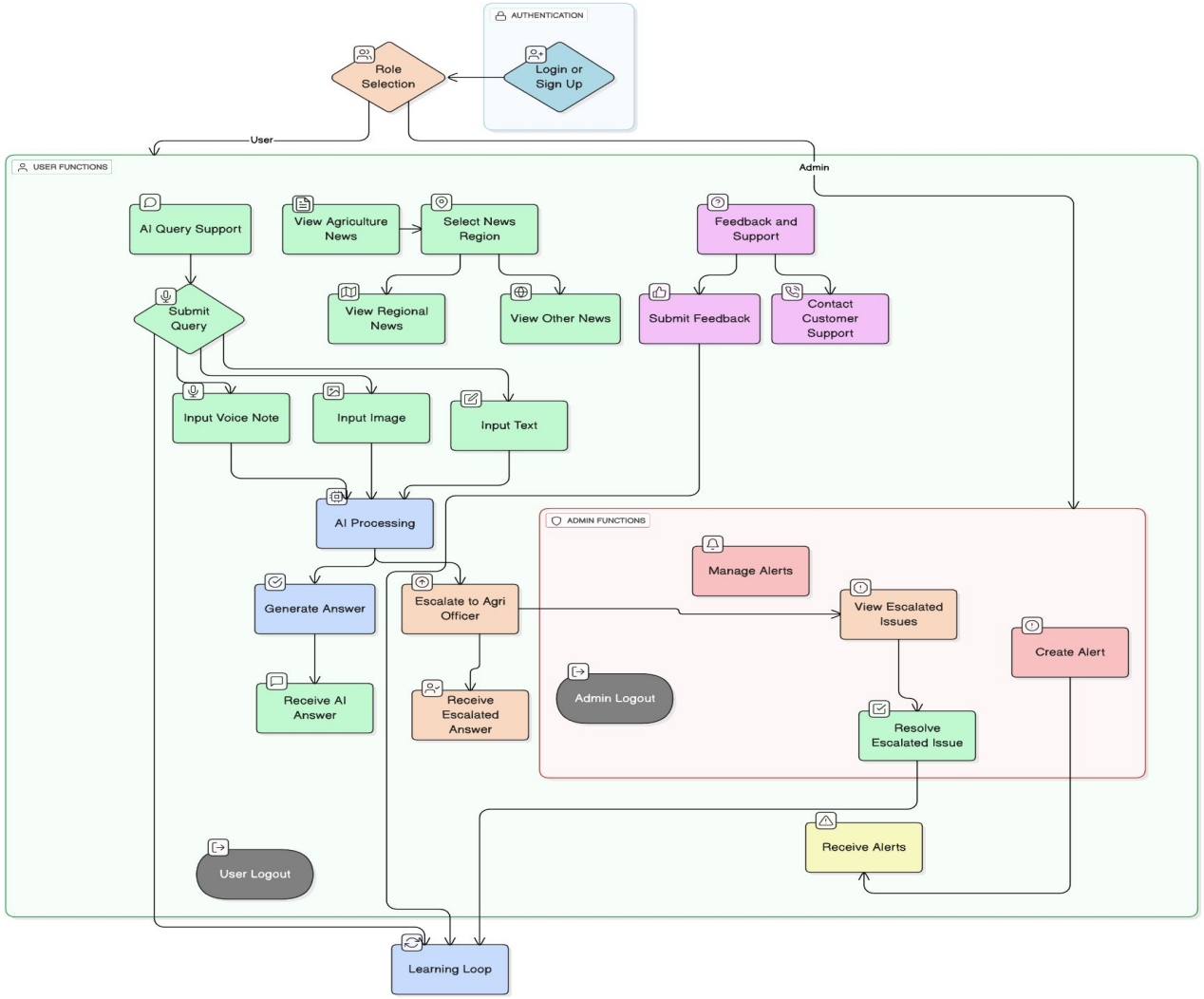
- **Frontend:** React, Tailwind CSS, Framer Motion, shadcn/ui, Flowbite React
- **Backend:** JavaScript, TypeScript, Node.js, Express.js, MongoDB, Firebase, RESTful APIs
- **AI/ML:** Python, ChatGPT, TensorFlow, Langdetect, Pydantic, LangChain
- **APIs/Integrations:** Auth0, Twilio, OpenAI, Gemini
- **Deployment & DevOps:** Vercel, Render, GitHub, GitBook, Docker
- **Add-ons/Tools:** Postman





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FEASIBILITY AND VIABILITY

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Feasibility:

1.**Technical:** Utilizes existing technologies(web,AI).
2.**Financial:** Launch in a few regions and scale with usage.
3.**Market:** Strong need for local language advice, image diagnosis, and nearby weather/disease alerts.
4.**Operational:** Set confidence thresholds; auto-escalate low-confidence cases.

Viability:

1.**Multiple revenue streams:** Subscriptions, enterprise SaaS/API deals, partner commissions, and seasonal sponsorships/ads.
2.**User base:** Millions of farmers nationwide.
3.**Scalability:** Expand coverage and features stepwise across regions, crops, languages, and channels.
4.**Long-term value:** Use historical advice, strong local knowledge, and measured outcomes to improve results and deepen loyalty.

Challenges:

1.Uncertain Answers: Some automated responses may be low confidence.
2.Language and Literacy: Many dialects and low reading ability among farmers.
3.Bad connectivity: Remote areas with weak networks.
4.Trust and Adoption: Farmers may be reluctant to rely on a new tool.

Solutions:

1.Human Escalation: Route low-confidence cases to regional agronomists.
2.Voice First UX: Deliver advice via voice and local languages.
3.Low-Data Modes: Offer SMS fallbacks and resumable uploads.
4.Pilot Demonstrations: Show results on demo farms to build trust.

Business Potential:

1.Partner commissions on inputs, insurance and referrals.
2.Seasonal brand campaigns create high-margin revenue.
3.Premium add-ons (image checks, priority support, advisory packs) raise ARPU.
4.Usage-based spend and phased rollouts improve unit economics.

Supporting Facts

Grand View Research did a survey which suggests that the India *Farming-as-a-Service* market size is about **USD 116 million in 2024**, expected to grow to **USD 474.6 million by 2033**, at ~17.1% CAGR. Grand View Research

LinkedIn / Decadal Outlook Crop Advisory Services in India reports ~150 million farmers in India, but only about **10%** using digital advisory platforms — leaving **~90%** untapped potential. LinkedIn

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IMPACT AND BENEFITS

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Potential impact on the target audience

- **Boost in crop yields:** Tailored, timely advice and early warnings improve practices and help extract more output from the same land.
- **Lower input costs:** Optimized fertilizer, pesticide, and water use reduces spend while preserving soil and plant health.
- **Stronger risk protection:** Real-time weather and disease alerts enable preventive action, avoiding major seasonal losses.
- **Better market outcomes:** Price signals and regional trends guide when and where to sell, improving realized farmgate prices.
- **Improved financial access:** Clean digital records and consistent practices enhance creditworthiness and insurance eligibility.

Benefits of the solution:

Social:

- Local-language, voice-first guidance widens access and inclusion.
- Community alerts with clear steps enable coordinated, trusted action.

Economic:

- Timely, tailored advice boosts productivity and cuts waste.
- Better planning smooths cash flows and reduces bad-season impact.

Technological:

- Real-time, hyperlocal alerts drive faster, proactive decisions.
- Multimodal inputs with simple UX work across devices and literacy.

Environmental:

- Targeted irrigation/nutrients reduce water use and runoff.
- Early detection and precise sprays lower chemical load.

Governance/Services:

- Step-by-step workflows raise scheme, credit, and insurance uptake.
- Logged actions create transparent records for audits and subsidies.

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RESEARCH AND REFERENCES

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Details / Links of the Reference and Research Work

Agriculture Data Sources

- **Telangana Agriculture Crop Master List** – Crop codes, names, and classification for Kharif & Rabi crops.
  🔗 https://www.ecostat.telangana.gov.in/Agriculture/agri_crop_list
- **mKisan Portal – USSD Structure & Codes** – Mobile-based services for farmers (USSD, SMS, IVRS, advisories, mandi prices).
  🔗 https://www.mkisan.gov.in/Alpha/aboutussdstructureandcode.aspx
- **Kerala Agricultural University – Varieties Released** – Official list of improved crop varieties (Rice, Coconut, Vegetables, Spices, Cashew, Cocoa etc.).
  🔗 https://www.kau.in/basic-page/varieties-released

AI & Research Platforms

- **Google AI for Developers** – AI/ML resources, APIs, model documentation.
  🔗 https://ai.google.dev/
- **OpenAI API** – Access to advanced AI models for NLP, chat, code, and analytics.
  🔗 https://openai.com/index/openai-api/
- **Google AI Studio** – Sandbox environment for building and testing AI solutions.
  🔗 https://aistudio.google.com/welcome

Comparison with other LLM

Features	Our Farming Assistant AI	General LLMs (GPT-4, Gemini)
Knowledge Base	Trained exclusively on agri data	limited agriculture focus
Context Awareness	Incorporates farmer location, crop, history, and seasonal trends to personalize advice.	Limited ability to recognize agriculture-specific context without extra prompting
Continuous Learning	Integrates feedback from queries, expert corrections, local events to improve each season	General LLMs improve globally, but may not access niche or local agri data quickly
Region-wise Adaptation	Tailors responses to specific districts, soil types, local crop calendars, and climate data for every region	Lacks dynamic adjustment to regional variations unless explicitly prompted each time
Farmer-Specific Guidance	Learns individual farmer's crop history, preferences, subsidy eligibility, and previous feedback, offering uniquely personalized advice	Only provides generic answers; usually ignores farmer's past history or local profile

Deployment :- https://ai-farmer-assistant-seven.vercel.app/